

Antibody microarray analysis in the field to analyze protein expression at hydrothermal sites in Spitsbergen and Kamchatka

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We have proposed “microbe-specific” antibody (Ab) microarrays as tools for *in situ* life detection in space due to their small size, reduced amount of sample required and ability to analyze hundreds of biomarkers at the same time. Following development of such an array in the laboratory to detect bacterial antigens in Mars analog regolith (*Maule et al.* abstract in this meeting), we took these Ab microarrays to hydrothermal sites in Svalbard (Arctic) and active volcanic craters in Kamchatka (far east Russia) to support *in situ* analysis of microbial populations (*Toporski et al.* abstract in this meeting). These Ab microarrays targeted 7 different biological molecules: lipopolysaccharide (LPS), DNA, peptidoglycan, collagen, groEL, β -galactosidase, melanoidin and mycoplasma. Although microarray printing took place in the lab, all steps of the microarray assay took place in the field, including: sample extraction, sample labeling, removal of free label, array blocking, sample incubation with the array, detection of antibody-bound labeled antigen with an enzyme-generated color reaction, scanning and image analysis. Sterile technique was used throughout the 2-3 hour assay, during which weather conditions were often below 4°C, windy, dusty and visibility was sometimes limited to a few feet by volcanic gases. Initial results show high expression of groEL (a type of chaperonin protein involved in protein folding and constitutively expressed in most bacteria) at most sites and melanoidin (a protein breakdown product) on the edges of active hot pools. Ab microarrays printed with antibodies against additional biomarkers will support further studies in environmental microbiology.